SDMS US EPA REGION V -1

SOME IMAGES WITHIN THIS DOCUMENT MAY BE ILLEGIBLE DUE TO BAD SOURCE DOCUMENTS.

ZONE A

CHLOROBENZENE

INDUSTRIAL HYGIENE

AND

RCRA

TRAINING OUTLINE

APPENDIX

DEPARTMENT 233 (MCB)

BENZENE HYGIENE AND ENVIRONMENTAL TRAINING PROGRAM

Conducted by: _____ Date: _____

Outline

1. Review 1982 performance in training and implementation of Benzene Hygiene Program.

2. Conduct individual fit of respirator of each person in attendance.

3. Using video tape, show health hazards of Benzene, production work practices and details, medical surveillance, toxicoloty, air monitoring, personal protective equipment and personal hygiene.

4. Instructions on care of personal respirator, including cartridge change weekly, and respirator change monthly.

5. Hand out Safety Procedure booklet, discuss section on personal protective equipment when sampling, loading and unloading cars, drums, etc. and breaking into lines. Strong emphasis on handling and drumming residue. Instruct noncompliance on use of personal protective equipment can result in disciplinary action.

6. Discuss RCRA: new government regulations:

   A. Residue drumming facilities - stop drumming when leaks occur - notify supervision immediately.

   B. Periodic inspection of stored residue drums.

   C. Recording and verification of tank levels when transferring in or out of tanks. Recording and reporting any leaks at pumps, valves, or piping.

   D. In event of spills, contact supervision immediately to assist in containment or disposal or a spill. Also contact plant environmental group.

7. Discuss plant Sewer Emergency Plan.

   Hand out Department 233 Emergency Plan, thoroughly discuss checklist for checking possible sources of Benzene getting into plant sewer system and what to do.

8. Review program with question and answer period.

CER 089431

SEWER EMERGENCY ACTION PLAN

A plant sewer emergency is basically a flammable sewer situation. It will be declared throughout the plant by the appropriate fire call for the plant zone affected. Department personnel should immediately and automatically carry out the following Sewer Emergency Action Plan.

R. E. Howard

August 6, 1982

Sewer Emergency Action Plan
Chlorobenzene Complex (Revision 1)

cc J. Boehm
E. Valentine
Zone A Shift Supvs.
Night Superintendents
W. Conant
D. Mayer

TO S. Smythe
A. Johnston

Attached please find the revised "Chlorobenzene Sewer Emergency Action Plan". The previous plan is obsolete as a result of the recent commissioning of the benzene collection system (CEA 3322). Please review this revised plan with your personnel.

Let's plan on a dry run of this action plan in the first week of September (provided I'm mobile). Any problems or difficiencies should be uncovered and can then be addressed.

REH

R. E. Howard

sac

CHLOROBENZENE SEWER EMERGENCY ACTION PLAN
(Revision 1 - July 30, 1982)

Historically the potential loss of free organics from the Chlorobenzene complex has been recognized as a possible contributor to abnormal sewer conditions (flammable mixture). Such a loss would have its greatest potential impact on the west plant sewers. This risk has been substantially reduced through the recent installation of a "collection pit" and related separation equipment. This system pretreats all department effluent for recovery of free organics prior to release to the plant sewer system.

There are three effluent streams (reference attached sewer layout) from Departments 233 and 218, which could be organic laden:

1. Underflow from light layer separator (Item 187)

   - exits on north side of the department and enters plant sewers at Box 3-G, (sealed lid) and joins the main flow at Box 33-F (corner of "D" and 4th Streets).

2. Overflow from heavy layer separator (Item 190)

   - exits on south side of the department and enters plant sewers at Box 33-C-1 (3rd Street).

3. Underflow from collection pit (Item 182)

   - exits south side of the department and enters plant sewers at Box 33-C-1 (3rd Street).

In the event the west plant sewers are "hot" the following actions are to be implemented:

1. Profile the flammability of sewer boxes on "D" Street (Boxes 33-F, 33-E, 33-C, and 33-B). The intent is to determine the most probable exit point from the department (e.g. higher readings near 3rd Street imply losses from the south side of the department). The implementation order of the following checks will be based on this profile.

CER 089434

CHLOROBENZENE SEWER EMERGENCY ACTION PLAN
(Revision 1 - July 30, 1982)

2. Verify the specific gravity of the heavy layer separtor overflow is within normal range (1.0 ± .05 at 25°C) sample the stream and observe for organic presence (emulsion or two phase layer). If organics are present direct* the flow to the collection pit.

3. Verify the specific gravity of the light layers underflow is within normal range (1.0 ± .05 at 25°C). Sample the stream and observe for organic presence (emulsion or two phase layer). If organics are present direct* the flow to the collection pit.

4. Verify the collection pit operations are normal (i.e. pumps are in operation and are moving liquid). If the pit is underflowing (level ≥ 100%) as a result of rain, 218 drowning jet, or pump failure, sample the quality of the underflow at the vent (located east of the benzene trap compartment). Observe for organic presence (emulsion or two phase layer). If organics are present, then the pit's capacity to contain organics has been exceeded. Immediate steps to identify and correct the process loss must be taken. A check list of potential loss points follows:

Process Source Checklist

a. Check "free" benzene quantity in 113 benzene/water separator ~~event~~ vent (normal ≤ 1%).

b. Check the pressure at the 113 benzene/water separator (normal 1-2 psig). High pressure may be an indication of poor condensation and can be caused by:

1) high benzene column vent temperatures
2) loss of water flow to the benzene column vent condenser
3) loss or reduced MCB flow to the separator vent condenser.

Redirection of effluent from 187 tank and 190 tank in response to out of range specific gravity is automatically initiated by interlock. Confirmation of proper action must be made. Manual redirection can be initiated by panel mounted selector switch. Redirection is a temporary solution to an organic loss problem. The limited capacity of the pit requires that immediate steps to correct the layer inversion or accumulation in the separators be implemented. Substained department operations require that normal effluent direction to the plant sewers be resumed ASAP.

CER 089435

CHLOROBENZENE SEWER EMERGENCY ACTION PLAN
(Revision 1 - July 30, 1982)

If pressures/temperatures are excessive, reduce column feed rates.

c. If off gas HCl is being sewered, check gas temperature. If temperature is high ($\geq$ -10°C), determine cause of poor cooling and correct (compressor problem or cooler freeze up). Reduce chlorinator rate if cooling can not be restored.

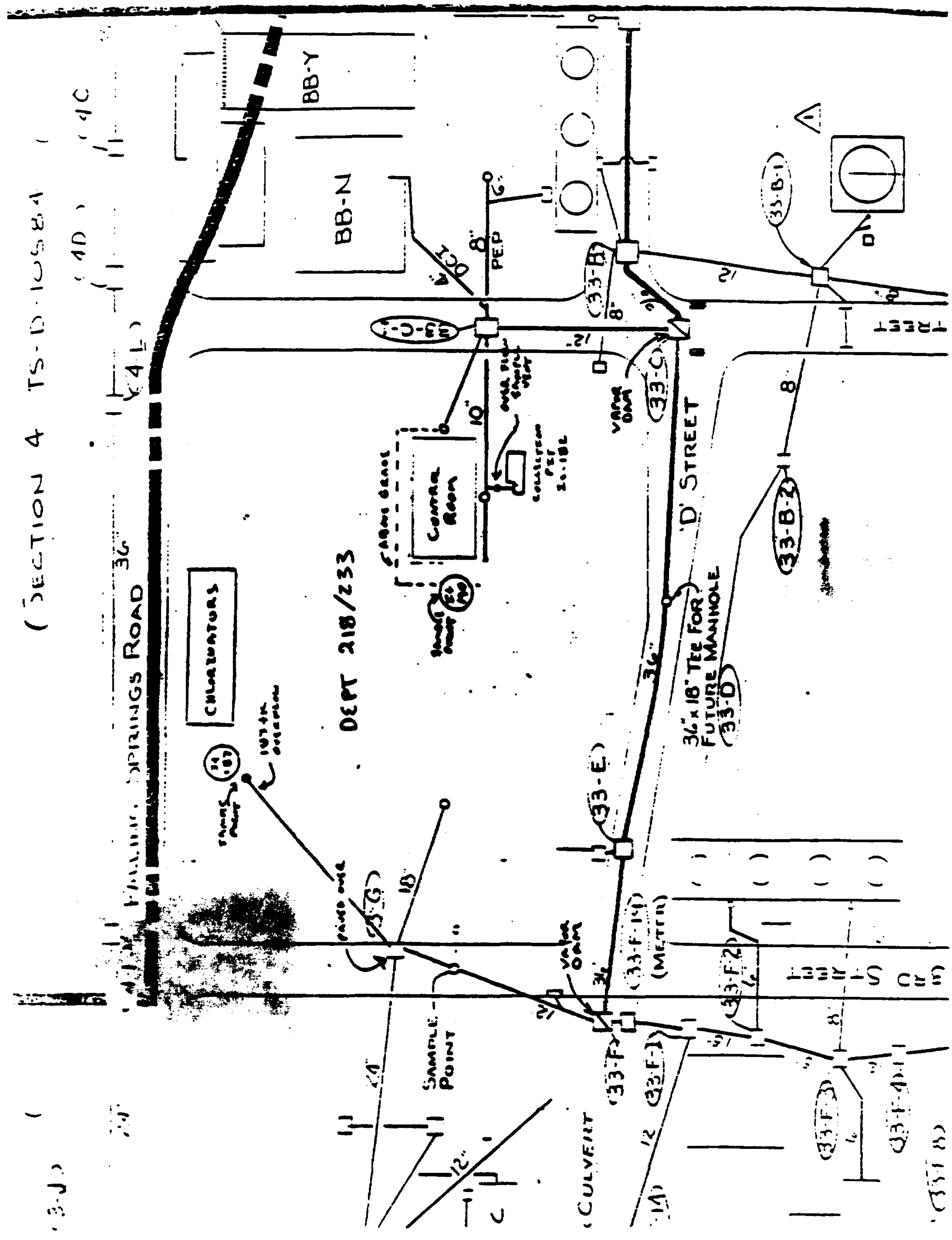
In the event the east plant sewers are "hot", investigate operations at the E-Still.

1. Check the jet barometric leg effluent for excessive loss of organics to the sewer. If organics are present take actions to correct. Shut down of the E-Still is an alternative.

2. Survey tank car loading spots and storage areas for leaks to the sewer. Contain any spills.

As soon as time permits, the Emergency Control Center should be informed of status of action plans and corrective actions in effect.

SAS



Monsanto Addendum A

INTER-OFFICE CORRESPONDENCE

DATE: May 20, 1983

SUBJECT: Incident Investigation
Department 233

REFERENCE:

TO: J. Boehm

cc: E. Stewart
J. Venitz
D. Armstrong
E. Valentine
S. Smith
F. Matthews
W. Smull
J. Molloy

SUMMARY

Date of Incident:	April 29, 1983
Type of Incident:	Approximately 12:45 p.m.
Location:	Department 233 sewer outflow
Type of Incident:	Hot sewers
Most Probable Causes:	Inadequate separation in sewer pit due to mixing of benzene and MCB.

Investigating Committee

R. Howard
J. Peduzzi
K. Nesvik, Chairman

skg
att.

CER 089438

INCIDENT

Hot sewers (vapor measured within 10% of the Lower Explosive Level (L.E.L.) were detected downstream of Department 233 (Monochlorobenzene).

BACKGROUND

In past years, the MCB department had been a significant contributor to a series of flammable organic fires and explosions which occurred in the plant sewers. CEA 3322 - MCB Benzene Reduction - addressed this problem by providing new facilities to remove free organics from waste water leaving the department. The waste water facilities contain three major pieces of equipment: Collection Pit - Item 182, Heavy Layer Pump Tank - Item 190, and the Collection Tank - Item 187.

The purpose of the Collection Pit is to collect, contain, and gravity separate all process fluids draining from the MCB and Muriatic Acid (Department 218) operating facilities. The pit is made up of three compartments (Figure 1). The first compartment collects flows from the process drain system including the benzene contaminated streams coming off the benzene - water separator drain leg and vent scrubber. The organic waste streams entering the first compartment are routinely pumped to the Collection Tank for further separation. This first compartment overflows into the intermediate compartment of the Collection Pit during high flow rates.

The intermediate compartment receives the flows from the area drains and Department 218. Under normal conditions, these flows are relatively low, and the entire stream overflows to the third compartment where it is separated and pumped to Items 190 and 187. However, a high load condition can occur when Department 218 is drowning acid, or with a heavy rain or large spill. Under this condition the pit pumps can't keep up with flow and the levels in the intermediate and third compartments rise until the heavier water phase begins underflowing to the plant sewer (Figure 2).

The third compartment of the Collection Pit separates the overflow from the intermediate compartment into a light and heavy layer. The compartment is level controlled by pumping out the heavy layer (containing mostly water, but some MCB) to the Heavy Layer Pump Tank (Item 190). The light benzene layer is continuously pumped to the Collection Tank (Item 187). As previously mentioned, during periods of high loading, the pumps become overloaded and the water phase underflows out from the intermediate compartment.

The second piece of equipment of the waste water facilities is the Heavy Layer Pump Tank (Item 190). Most of the collected waste water is pumped to this vessel from the Collection Pit. Heavy layer organics (MCB's) are retained in the bottom dish

and transferred intermittently to the Collection Tank. The water phase from Item 190 overflows continuously to the plant sewer. This is the second point at which aqueous wastes can exit the process area. A nuclear density meter installed in the overflow is designed to alarm when a heavy layer is detected and divert the stream back to the process sewer.

The third piece of equipment is the Collection Tank (Item 187) (see Figure 1). The vessel receives waste streams pumped from the first and third compartments of the Collection Pit. This vessel is designed to separate the light and heavy layer organics from the aqueous phase. The light layer organics overflow continuously to the Overflow Receiver for recycling into the process. The heavy layer is retained in the bottom of the tank for further processing. The aqueous layer flows continuously to the plant sewer. This is the third and final point at which wastes enter the plant sewer. A nuclear density meter also monitors this flow. On a high or low density reading the stream is diverted to the process sewer.

DESCRIPTION OF INCIDENT

The MCB department had started up at 7:30 p.m. on April 28. The department was coming off its spring turnaround and problems developed with the chilled MCB (mono) refrigeration system. The system, which supplies coolant to the HCl off gas coolers, could not be started up due to a chilled mono pump seal failure and leaking block valves. The decision was made to continue running until repairs could be made in the morning.

With the refrigeration system down, the benzene and MCB could not be adequately condensed out of the HCl gas stream. As per standard procedure, the contaminated gas was diverted to the HCl drowning jet system, which scrubbed the gas to the sewer. The department continued to operate in this manner throughout the night and up until the time of the incident.

The next morning, activities to change out the chilled mono pump began. Due to the leaking block valves, the first step was to drain the MCB coolant from the system. At 8:00 a.m., the MCB from the high stage cooler and associated surge tank was drained to the process sewer system.

At approximately 10:30 a.m., a dichlor odor was detected coming out of box 33-B, located downstream of Department 233 (Figure 3). A gas tester analyzed the vapor at 40% L.E.L. (a continuous sewer analyzer with alarm is located in the Department 233 control room. However, it failed to indicate any flammables.) A department survey was quickly instituted to determine the source of the organics in the sewer. No organics were seen in the underflow from the Collection Pit. However, a heavy organic layer was found in the discharge stream off the Collection Tank (Item 187). The nuclear density

meter had failed to detect the heavy layer and thus the stream was continuing to flow to the plant sewer. At 10:40 a.m., the stream was manually diverted to the process sewer, which flowed to the Collection Pit. By 11:15 a.m., box 33-B had cooled to 10% L.E.L.

At approximately 12:30 p.m., Department 221 called Department 233 to report a hot sewer next to their railroad tracks. The sewer registered 90% L.E.L. Department 233 personnel began another survey and discovered a layer of light organics exiting with the aqueous phase from the Collection Pit (as the refrigeration system was still down, HCl off gas stream was still being drowned). At 12:57 p.m., the fire whistle was sounded and a sewer emergency was declared.

The reason for the sewer contamination was not readily apparent. However, it was known that organics were continuing to be fed to the collection pit via the Department 218 drowning jet. In order to stop this flow, preparations for the shut down of the cell house/MCB flow train began at 1:15 p.m. At 1:40 p.m., the MCB chlorinators were shut down. By 2:37 p.m., the flammability at sewer box 33-B had dropped from over 100% to 10% of the L.E.L. At 2:55 p.m., the level had dropped to 5% and the all clear was signaled.

FINDINGS

1. This is the first flammable sewer incident that has originated from Department 233 since the new sewer system installation was completed in February 1982. By comparison, there were seven sewer incidents attributed to Department 233 in 1981 and 12 incidents in 1980.

2. Approximately 500 gallons of MCB were drained from the chilled mono system into the process sewer. This was enough to overload the retention capacity of the Collection Tank (Item 187) causing the first incident. (Item 187 already contained MCB collected from the turnaround clean out.)

3. The nuclear density gauge installed on the water underflow of Tank 187 did not detect the MCB flowing with the water. The organic phase was not of sufficient quantity to change the fluid density enough to activate the interlock. This is the second time that the interlock system has failed to detect and divert organics.

4. It is estimated that 2-4 gpm of benzene and MCB were being entrained with the HCl off gas while the refrigeration system was down. This organic load to the sump collection system is semi-routine, since it occurs whenever there are problems with the HCl cooler/refrigeration system.

5. The intermediate compartment contained a bottom layer of carbon and gravel varying between one to two feet deep. This layer reduced the retention time in the compartment by 30%.

6. No organics were detected leaving the collection pit during the first incident. A sample of the light organic layer in the pit was taken shortly after the second incident. The organic layer had a specific gravity of 0.966. An in-department GC analysis gave a composition of 55% benzene, and 43% MCB.

7. There is no sight glass or other means to detect the level of the heavy layer in tank 187.

8. It rained the morning of the incident. This contributed to the collection pit loading.

DISCUSSION

The Department 233 waste water facilities are designed to remove organics from the aqueous phase via gravity separation. The lighter than water benzene level floats to the top and is recycled back to the process. The heavier than water MCB layer settles to the bottom of the collection vessels and is either recycled or drummed off. The water layer, relatively free of organics, is allowed to flow into the plant sewer. At the time of the incident, it appears that a series of events led to the creation of a neutral buoyancy organic layer which flowed out the collection pit with the aqueous layer.

In order to create a neutral buoyancy layer, three conditions must be met: 1) benzene present in sufficient quantity; 2) MCB present in sufficient quantity; and 3) a mechanism available to mix the two chemicals. All three of these conditions were met during this incident:

1. Benzene had been present in the sewer system since starting the night before. It was contained in the HCl off gas being scrubbed by the drowning jets. The benzene had been separating from the water layer efficiently all through the night, as no benzene was originally detected in the water underflow.

2) MCB entered the sewer system when the high stage cooler and the surge tank were drained that morning. However, this did not present any immediate problem since the benzene and MCB flows remained separated. The benzene flowed into the intermediate compartment, where it separated from the water phase and overflowed into the third compartment. The MCB drained into the first compartment, where it was pumped to the collection tank (see Figure 4).

3. The third condition, mixing, was met when the MCB filled the collection tank and began overflowing through the water outlet to the plant sewer. To prevent the MCB from entering the plant sewer, it was diverted to the process sewer, where it flowed to the first compartment of the collection pit. However, this compartment was already full of MCB. With the addition of the recycle flow, the MCB rich phase overflowed to the intermediate compartment, where it mixed with the benzene from the drowning jets. The buoyancy mixture that was produced underflowed out the compartment with the aqueous phase (see Figure 5).

The presence of a layer of solids in the bottom of the intermediate compartment probably worsened the condition to a degree. However, it is felt that organics would have flowed to the plant sewer even if the compartment had been clean.

The nuclear density meter failed to detect MCB coming from the separation tank and divert the stream to the process sewer. However, if the interlock had functioned as designed, the MCB would have been automatically fed to and mixed with the benzene in the pit. The purpose and function of this interlock needs to be reevaluated.

RECOMMENDATIONS

1. Revise the operating procedure to not knowingly drop heavies (MCB) to the sewer when there is a high benzene load to the sewer. MCB may be dropped if it can be determined there is enough room in the collection tank to hold the drop. Communicate this procedure to all associated production personnel.

   Responsibility: Production
   Timing: Complete

2. Provide a sight glass on the collection tank 187 to monitor the heavy layer level.

   Responsibility: TSD
   Timing: Design package by July 15, 1983

3. Clean the solids out of the intermediate compartment. Begin routine visual inspection to develop adequate clean out frequency.

   Responsibility: Production
   Timing: Clean out complete. Clean out schedule developed by August 1, 1983.

4. Reevaluate interlock system on collection tank and heavy layer pump tank.

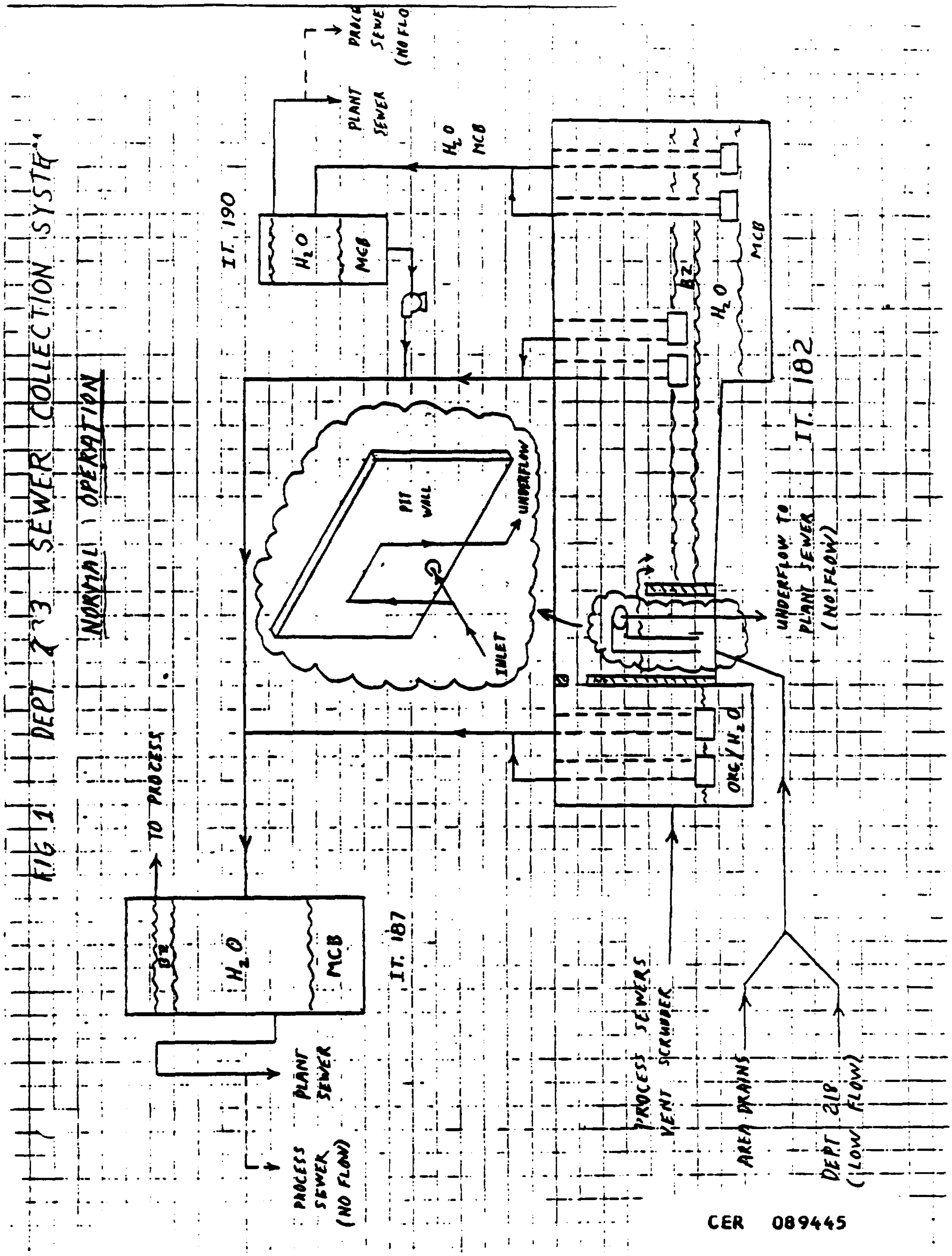
   Responsibility: TSD
   Timing: Evaluation complete by September 1, 1983.

5. Evaluate alternate methods of recycling the heavy organic layer back into the process.

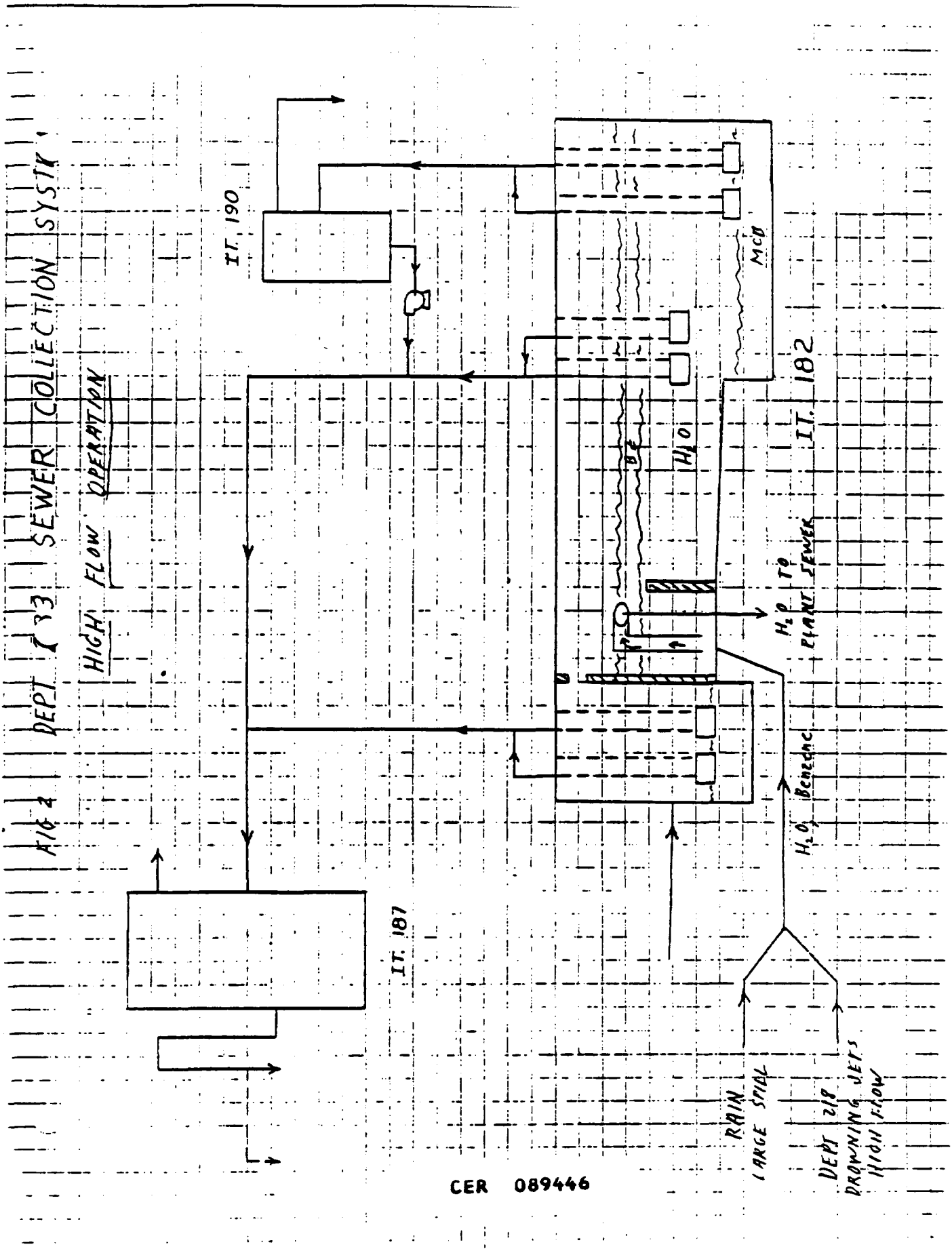
   Responsibility: TSD
   Timing: Evaluation complete by September 1, 1983.

6. Review and reevaluate the need for and reliability of the continuous sewer analyzer.

   Responsibility: TSD/Anal. Instr. Group
   Timing: Recommendation by August 1, 1983



CER 089445


DEPT 233 SEWER COLLECTION SYSTEM
HIGH FLOW OPERATION
A/O 4
IT. 190
IT. 187
IT. 182
MCC
H_2O
BE
H_2O TO PLANT SEWER
H_2O Benzene
RAIN
LARGE SPILL
DEPT 218
DRAWING JETS
HIGH FLOW

CER 089446

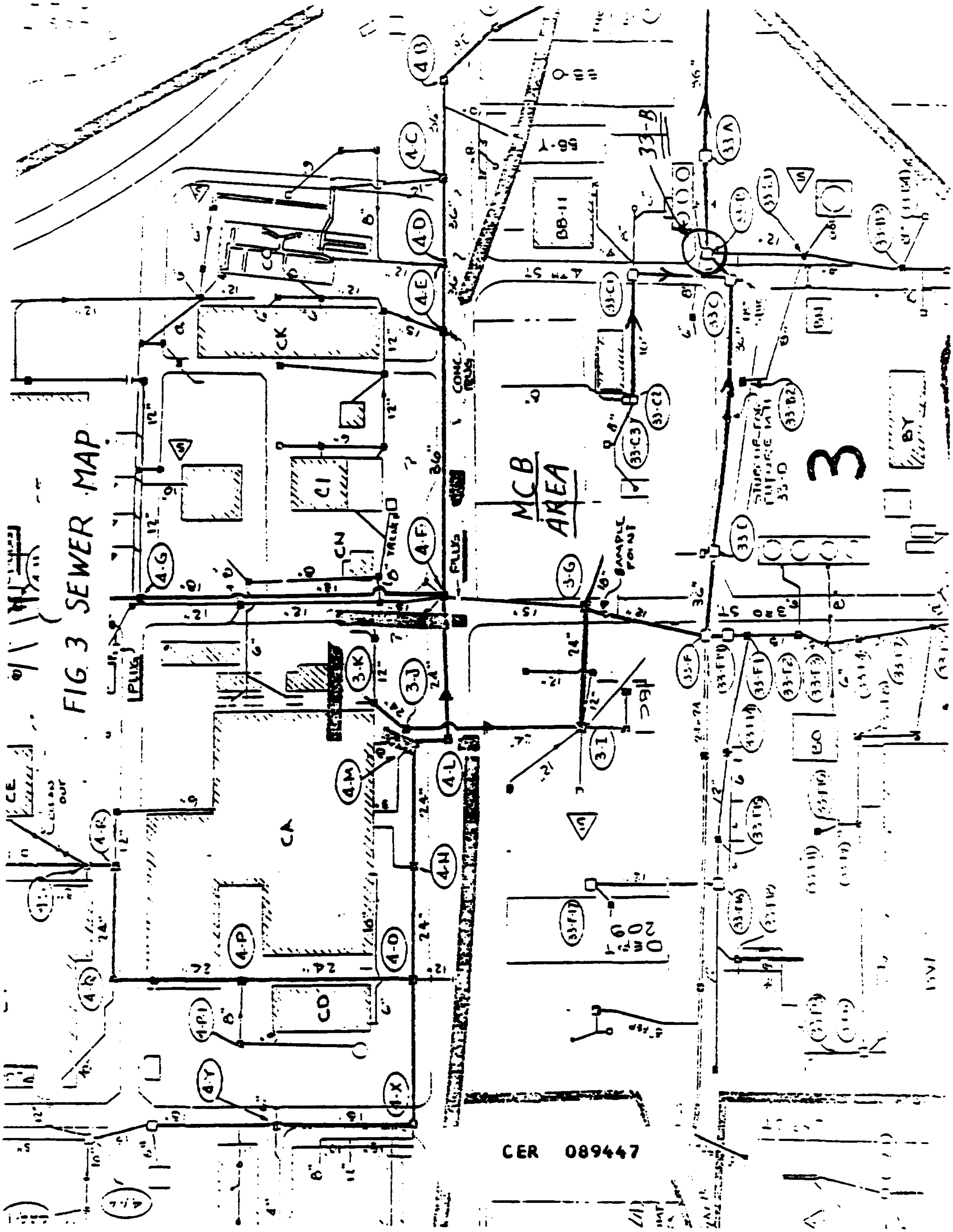
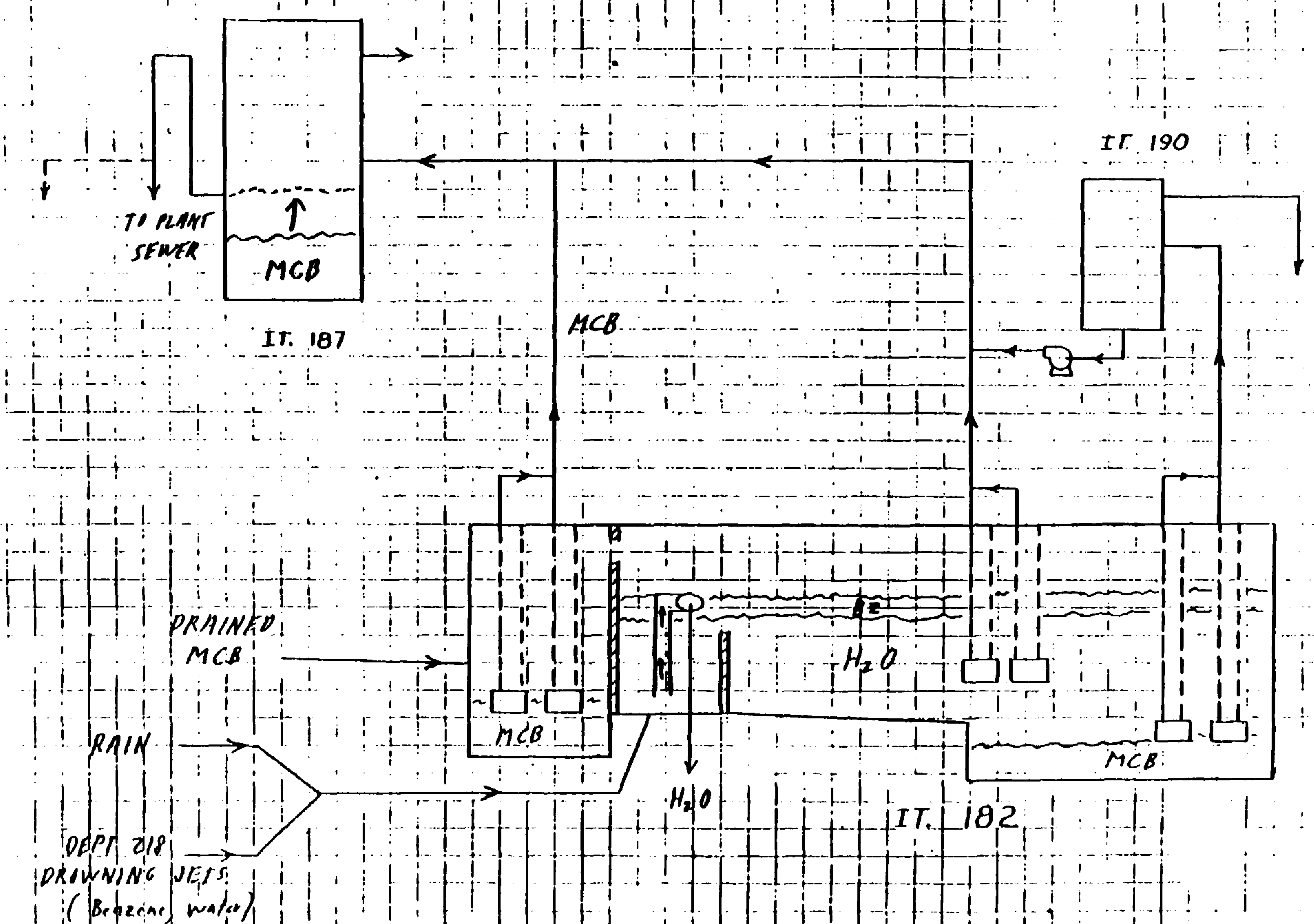


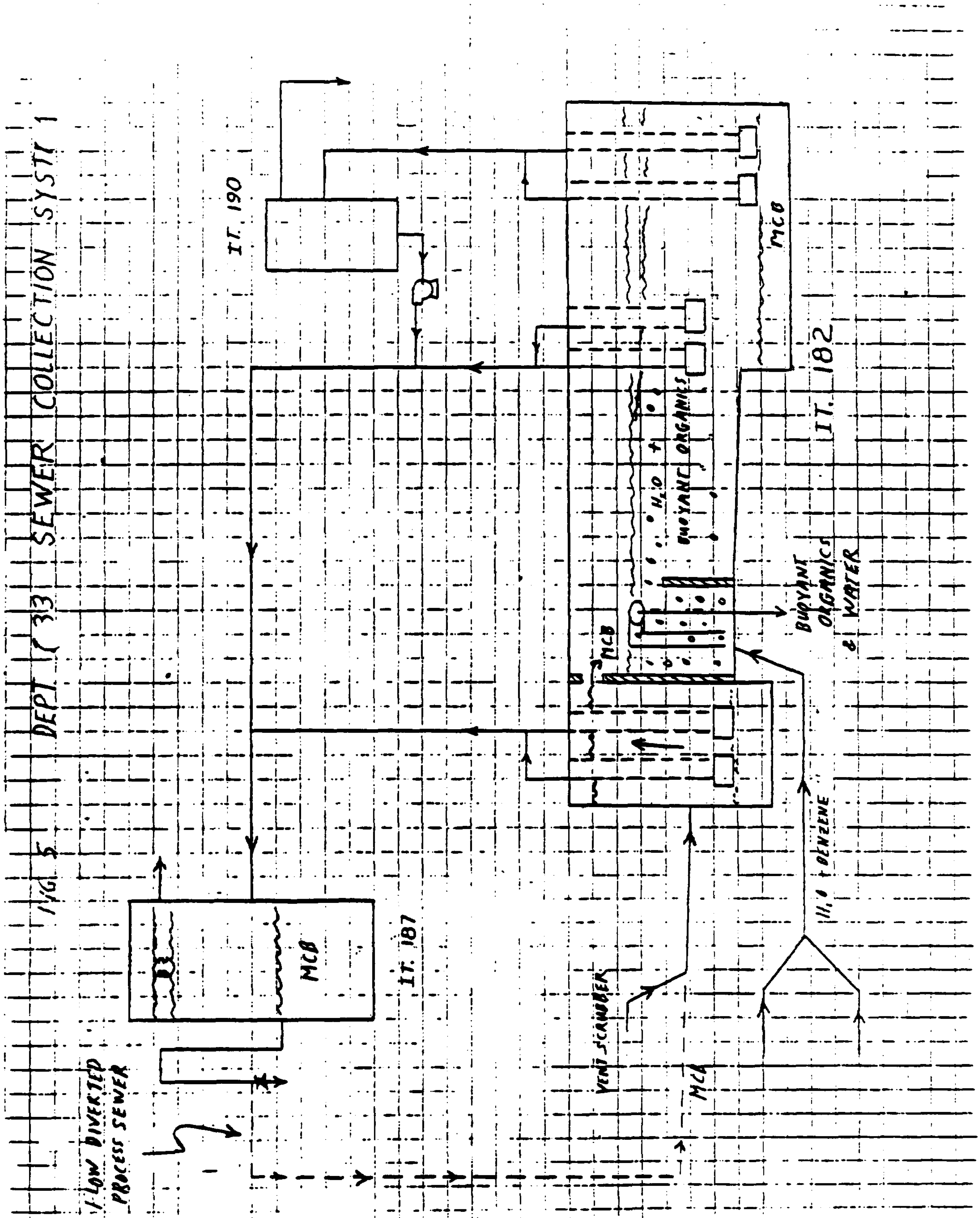
FIG 3 SEWER MAP
MCB AREA
3
SAMPLE POINT
CONC.
CA
CK
CI
CD
CE
BY
BB-11
33-B
4-G
4-F
4-E
4-D
4-C
4-B
4-H
4-L
4-M
4-P
4-R
4-X
4-Y
3-G
3-J
3-K
3-I
33-C
33-C1
33-C2
33-C3
33-F
33-F1
33-F2
33-A
33-B2

CER 089447

FIG. 4 DEPT 133 SEWER COLLECTION SYST. 1

DURING MCB DRAINING





CER 089449

EMERGENCY HEADCOUNT AND DISASTER PLAN

Plant Emergency Procedures

Department Fire/Emergency --

a. Turn in fire alarm if the emergency is a fire (Dial Ext. 2000 and report a fire - 2-2 = Department 218/233, 1-3 = Department 224, 3-3 - Big Mo). 3-4 North Lot Storage Area.

b. If the emergency is something other than a fire (fume emission, major spill, etc.), notify department supervision, if present, or shift supervisor or night superintendent on the off shifts, advising them of the emergency (shift supervisor at Ext. 2066, 2064 or radio channel 2, night superintendent at Ext. 2474 or Guard at 2015).

c. Notify all personnel in the area affected by the emergency.

d. Department personnel should follow emergency procedure so a headcount can be made. If you are out of the department and cannot get back to the department, report to supervision in the area where you are so that you may be counted.

e. Shutdown your equipment following the emergency shutdown procedures as outlined in the operating instructions.

f. All personnel proceed as directed to the primary assembly point to the west side of foreman's trailer. If this point is inaccessible, proceed to the secondary assembly point at the main parking lot. Stay together, and wait at this point for instructions from supervision.

Monsanto

FROM (NAME, LOCATION, PHONE) R. E. Howard

DATE September 29, 1982

SUBJECT Emergency Plan and Headcount Reporting

REFERENCE

cc E. Valentine
S. Smythe
H. Rivet
A. Johnston
Zone A Supervisor

TO : Chlorobenzene Personnel

The plantwide procedures for headcount reporting have been revised. It is important that each employee understands what actions he/she should take during an emergency in order to minimize the chance of personnel injuries. The headcount procedure is particularly vital to insure that rescue efforts are initiated for persons who are actually missing and to avoid needless and potentially hazardous searches for people who are safe but have failed to report.

A plant emergency will be signalled by five short blasts on the plant whistle repeated five times. When this occurs, the following action should be taken:

1) Each operator should conduct an orderly shutdown as instructed on the back of the night sheet.

2) The E-Still operator should report to the Fire Department duties as required. He will be accounted for by the Fire Department headcount coordinator. If there is no fire whistle, the E-Still operator is to report to the department primary assembly point. All other personnel should report to the primary assembly point (primary assembly point - west of foreman's trailer). On day shift Monday through Friday, the foreman or supervisor will take a headcount and report in to the Emergency Control Center (Station 2650 on days). On weekends and off shifts, the Department 218 operator will take the headcount and report in (Station 2660). You should remain at this assembly point until given further instructions.

3. If fire, fumes, or other hazardous conditions prevent you from reporting to the primary assembly area, you should go to the secondary assembly point which is south of the Department 221 cooling tower. Headcount and other procedures are the same as for the primary assembly area.

CER 089451

4. If conditions prevent you from reaching either of these points, you should report to the main parking lot where a headcount coordinator will account for you. The primary principle is that the Emergency Control Center is notified of your whereabouts.

You should be familiar and be ready to implement these emergency actions at any time. If you have questions concerning these procedures, your foreman or I will be happy to discuss them with you.

R. E. Howard

skg

CER 089452

CHLOROBENZENE AREA
PROTECTIVE EQUIPMENT REQUIREMENTS

A. Minimum Protective Equipment

The "minimum" protective equipment required for all personnel (both hourly and salaried) working in Zone A will be:

1. Hard hat
2. Safety glasses
3. Carrying an approved respirator
4. Safety shoes

B. Additional Protective Equipment Requirements

Respirator/Rubbers or Rubber Overshoes --

1. Clean up of benzene or benzene contaminated spills.

Respirator/Rubber Gloves/Apron --

1. Sampling benzene or any stream containing benzene

2. Sticking benzene containing tanks.

Respirator/Rubber Gloves/Rubbers or Rubber Overshoes/Apron --

1. Pigging or pulling the pig.

2. Unloading benzene cars or trucks.

3. Making benzene - water separations.

Respirator*/Goggles*/Face Shield*/Apron/Rubbers or Rubber Overshoes ---

1. Breaking into lines, pumps, or other equipment which may contain benzene or be contaminated with benzene.

Rubber Gloves ---

1. When handling PDCB blocks.

C. Respirators Used Chlorobenzene Area

Air Purifying Respirators for Organic Vapors and Acid ---

1. 3-M Brand (disposable) Organic Vapor/Acid Gas Respirator, No. 8725.

CER 089453

CHLOROBENZENE AREA
PROTECTIVE EQUIPMENT REQUIREMENTS

C. Respirators Used Chlorobenzene Area Cont'd.

2. Norton Respirator with 1400 3L cartridges for Organic Vapors/Acid Gases.

3. Full Face Organic Vapor Gas Mask (MSA).

2 - Purifying Respirators for Chlorine --

1. Wilson Respirator with R-25 cartridges.

Emergency Escape Apparatus --

1. Robert-Shaw Air Capsule.

CER 089454

Monsanto

12.

FROM: J. W. Boehm/F. B. Matthews - Krummrich

DATE: June 24, 1982

SUBJECT: Rupture Disks - Major Emissions

REFERENCE

TO: D. P. Alt, S. J. Henderson, M. E. Whelan, E. W. Valentine

yc [redacted] Return

Major emission incidents create problems we can no longer live with. For that reason, please institute the understanding with your people that any time there is a rupture disk release or other major emission from our processes, they will notify me as quickly as possible. You will also want to be knowledgeable since on all such instances you and I will decide if it is appropriate to shut down until the cause of the incident is corrected or measures taken to negate the effects of a repeat.

For purposes of this request, a major incident is one which goes outside the plant or had the potential to go outside the plant had atmospheric conditions been different.

J. W. Boehm

F. B. Matthews

mh Fellows:

As discussed above, I should be notified in the case of all emissions potentially significant in nature (In my absence go directly to Ed Valentine)

REH.

CER 089455

MONSANTO INDUSTRIAL CHEMICALS COMPANY

[redacted] PLANT

FINISHED PRODUCT SPECIFICATION

PRODUCT CODE	81071
DEPT OR CB	233
PAGE ____ OF ____	
APPROVALS - DATE	
SALES CODE	6360-000-03-0003
ISSUE DATE	12/30/80
SUPERCEDES SPECS DATED	2/2/79
GRADE	
MANUFACTURING SUPT.	J.W. Boehm 10/19/80
MGR. MANUFACTURING	J.F. Thompson
RESEARCH GROUP LEADER	M.A. Terpstra 11/13/80
MARKETING OR DEVELOPMENT PRODUCT MANAGER	D.C. Malm 11/17/80
MANAGER PRODUCT ACCEPTABILITY	C.P. Farley 12-8-80

Monochlorobenzene

Monochlorobenzene

C_6H_5Cl

1 x 16 oz bottle

Characteristics	Reject	LIMITS Manufacturing	LIMITS Unrestricted Sales	Method Number
(R). Appearance		Clear, mobile liquid with no free water	Clear, Mobile liquid with no free water	10300
(R) Color		25 APHA max.	25 APHA max.	10300
(P) GLC Analyses				T-1206
DCB		300 ppm max.	300 ppm max.	
BrBz		900 ppm max.	900 ppm max.	
Chloro Toluene		10 ppm max.	10 ppm max.	
Benzene		100 ppm max.	100 ppm max.	
MCB		99.86% min.	99.86% min.	
Water		0.02% max.	0.04% max.	10304
Foreign Odor		None		10301
Reaction to Methyl Orange		Neutral		10302
Distilling Range				10303
First Drop		131.5 C min.	131.5 C min.	
95% (1-96 ml)		0.5 C min.	0.5 C min.	
[illegible]		1.0 C max.	1.0 C max.	
Dry Point		133.0 C max.	133.0 C max.	

[redacted] other analyzed by request only.

CER 089456

G 2599 1 74

MONSANTO INDUSTRIAL CHEMICALS COMPANY

PRODUCT: Monochlorobenzene

SALES CODE: 6360-000-03-003

N.G. KRUMRICH PLANT

PAGE 2 OF 2 ISSUE DATE OF PAGE 1: 12/30/80

CUSTOMER REQUIREMENTS

CUSTOMER NAME	Monsanto Commercial Products Agricultural Division				
EFFECTIVE DATE	1/14/76				
CHARACTERISTICS	T-1206	LIMITS/METHOD NUMBERS			
	SPEC.	TYPICAL			
DCB	3000 ppm max.	200 ppm			
BrBz	900 ppm max.	350 ppm			
Chloro Toluene	10 ppm max.	0			
Benzene	500 ppm max.	25 ppm			
MCB	99.60% min.	99.94			

[redacted]

CER 089457

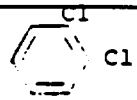
NOTE These requirements are a part of the Finished Product Specification for the customer shown. Characteristics and Limits listed may be discussed only with that customer.

G-2597 1 74

MONSANTO INDUSTRIAL CHEMICALS COMPANY

W.G. KRUMMRICH PLANT

FINISHED PRODUCT SPECIFICATION

PRODUCT CODE	81072
DEPT. OR JOB	224
SALES CODE	6650-000-55-003
ISSUE DATE	3/10/81
SUPERCEDES SPEC. DATED	5/19/78
PRODUCT (Trade Name)	O-Dichlorobenzene
GRADE	Technical
PRODUCT (Chemical Name)	O-Dichlorobenzene
CHEM. FORMULA	
SAMPLE FOR ANALYSIS	1 x 16 ox bottle

APPROVALS - DATE

CHIEF CHEMIST: H.J. Horner 3/10/81

MANUFACTURING SUP.: J.W. Boehr 3/25/81

MFG. MANAGER TURNING: J.F. Thomeson 3/24/81

RESEARCH GROUP LEADER: M.A. Terpstra 3/24/81

MARKETING OR DEVELOPMENT PRODUCT SPECIALIST: D.C. Malm 3/27/81

MANAGER PRODUCT ACCEPTANCE: C.P. Farley 3-9-81

Characteristics		LIMITS Reject	Manufacturing	Unrestricted Sales	Method Number
(R)	Appearance		Clear Liquid	Clear Liquid	10,005
(R)	Color (APHA)		40 Max.	40 Max.	10,005
(R)	Water		0.05% Max.	0.05% Max.	12,541
(R)	Ortho Dichlorobenzene		80% Min.	80% Min.	13,510
(R)	Turbidity		Std. 2 Min.		10,004
(R)	Residue		Slight Max.		10,004
	Specific Gravity (15.5/15.5°C)		1.307-1.313		10,002
	HCl		0.01% Max.		10,114
	Flash Point (TCC)		68°C Min.		10,115
	Crystallizing Point		-12.0°C Max.		10,001

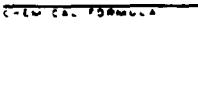
(R) Routine analysis, all others analyzed on request only.

CER 089458

MONSANTO INDUSTRIAL CHEMICALS COMPANY

W.G. KRUMMRICH PLANT

FINISHED PRODUCT SPECIFICATION

PRODUCT CODE: 81072	DEPT. OR JOB: 224
SALES CODE: See Below	
ISSUE DATE: 3/10/81	SUPERCEDES SPECS. DATED: 5/19/78
PRODUCT (Trade Name): Santochlor	GRADE: See below
PRODUCT (Chemical Name): Para-Dichlorobenzene	
CHEMICAL FORMULA: 	
SAMPLE FOR ANALYSIS: 2 x 16 oz bottles	

PAGE ____ OF ____

APPROVALS - DATE

CHIEF CHEMIST: H.J. Horner 3/9/81

MANUFACTURING SUPT.: J.W. Boehr 3/20/81

MFG. MANUFACTURING: J.F. Thompson 3/20/81

RESEARCH PRODUCT LEADER: M.A. Terpstra 3/2/81

MARKETING OR DEVELOPMENT PRODUCT MANAGER: D.C. Malm 2/27/81

MANAGER, PRODUCT ACCEPTABILITY: C.P. Farley 3-9-81

Characteristics		Reject	LIMITS: Manufacturing	LIMITS: Unrestricted Sales	Method Number
(R)	Appearance		White crystals free from dirt	White crystals free from dirt	10,094
(R)	Crystallizing Point		52.8°C Min.	52.8°C Min.	10,096
(R)	Color of Melt		Practically clear 30 APHA, Max.	Practically clear 30 APHA, Max.	10,095

Santochlor Type	Sales Code
Molten	6860-500-55-002
Blocks	6860-850-55-003
Crushed	6860-950-55-003

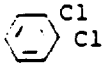
(R) Routine analysis, all others analyzed by request.

CER 089459

MONSANTO INDUSTRIAL CHEMICALS COMPANY

W.G. KRUMMRICH PLANT

FINISHED PRODUCT SPECIFICATION

PRODUCT CODE: 81072	DEPT OR JOB: 209	PAGE ____ OF ____
SALES CODE: Internal		APPROVALS - DATE
ISSUE DATE: 7/31/80	SUPERCEDES SPECS. DATED: 8/14/79	CHEM'T CHEM'S: H.T. Horner 7/21/80
		MANUFACTURING SUP'T: F.B. Matthews 7-23-80
PRODUCT (Trade Name): Ortho-Dichlorobenzene (Refined)	GRADE	MGR., MANUFACTURING: D.B. Edwards 7/24/80
PRODUCT (Chemical Name): Benzene, 1, 2 - dichloro		RESEARCH GROUP LEADER: J.N. Rapko 7/24/80
CHEMICAL FORMULA: 		MARKETING OR DEVELOPMENT PRODUCT MANAGER
SAMPLE FOR ANALYSIS: 1-16 oz WM Bottle		MANAGER, PRODUCT [illegible]: J.S. Metcalf 7/24/80

Characteristics	Reject	LIMITS: Manufacturing	LIMITS: Unrestricted Sales	Method Number
(r) Appearance		Clear Mobile Liq	Clear Mobile Liq	10005
(r) Color		15 APHA, Max	15 APHA, Max	10005
(r) Assay (ODCB)		98.0% Min	98.0% Min	T-1206
(r) Sulfur		0.3 ppm Max	0.3 ppm Max	S-013
(r) Moisture		0.015% Max	0.015% Max	12541

(r) Routine analysis

CER 089460

MONSANTO INDUSTRIAL CHEMICALS COMPANY

W.G. KRUMMRICH PLANT

FINISHED PRODUCT SPECIFICATION

PRODUCT CODE: 81013	DEPT OR CC: 216	PAGE 1 OF 1
SALES CODE: See Below		APPROVALS - DATE: CHIEF CHEM'S: H.J. Horner 3/8/83
ISSUE DATE: 4/4/83	SUPERCEDES SPECS DATED: 3/25/80	MANUFACTURING DEPT: J.M. Boehm 3/18/83
PRODUCT (Trade Name): Muriatic Acid	GRADE: Commercial	MGR. MARKETING SERVICES: R.A. Rohl 3/22/83
PRODUCT Chemical Name: Hydrochloric Acid		RESEARCH GROUP LEADER: D.K. Lynch 3/17/83
EMPIRICAL FORMULA: HCl		MARKETING OR DEVELOPMENT PRODUCT MANAGER: D.A. Swall 3/24/83
SAMPLE FOR ANALYSIS: 1 x 16 oz nm bottle		MANAGER PRODUCT ACCEPTABILITY: C.P. Farley 3/28/83

Characteristics	Reject	LIMITS Manufacturing	LIMITS Unrestricted Sales	Method Number
* Appearance		Colorless to yellow liq	Colorless to yellow liq	10,070
Color		250 APHA, max.		10,070
(R) Organics (including benzene)		25 ppm max.	25 ppm max.	13,400
(R) Hydrochloric Acid				10,103
20°Be		31.45-33.29	31.45-33.29	
22°		35.21 min.	35.21 min.	
23°		37.14 min.	37.14 min.	
Foreign Odor		Detectable aromatic	Detectable aromatic	10,075
Residue		Std. No. 3 max.	Std. No. 3 max.	10,079

Sales Codes:

20° 6430-200-003-03
22° 6430-220-003-03
23° 6430-230-003-03

(R) Routine analysis, all others by request only.

CER 089461

G.2599 1/74

MONSANTO INDUSTRIAL CHEMICALS COMPANY

W.G. KRUMMRICH PLANT

FINISHED PRODUCT SPECIFICATION

PRODUCT CODE: 61013	DEPT OR JOB: 218	PAGE ___ OF ___
SALES CODE: See Below		APPROVED - DATE
ISSUE DATE: 11/1/82	SUPERCEDES SPECS DATED: 10/8/79	CHEMICAL SERVICE: H.J. Horner 11/1/82
PRODUCT (Trade Name): Muriatic Acid	GRADE: A Grade	MANUFACTURING: J.W. Boehm 10/15/82
PRODUCT (Chemical Name): Hydrochloric Acid		MFG. MGT. ASSURING: W.W. Varnace 10/18/82
CHEMICAL FORMULA: HCL		RESPONSIBLE GROUP LEADER: D.K. Lynch 10/18/82
SAMPLE FOR ANALYSIS: 1 x 16 oz nm bottle		MARKETING OR DEVELOPMENT PRODUCT MANAGER: R.G. Glover 10/24/82
		MANAGER PRODUCT ACCEPTABILITY: C.P. Farley 10/29/82

Characteristics		Reject	LIMITS Manufacturing	LIMITS Unrestricted Sales	Method Number
(R)	Appearance		Essentially Colorless	Essentially Colorless	10,070
(R)	Color		35 APHA max	35 APHA max	10,070
(R)	Benzene		1 ppm max	1 ppm max	13,400
(R)	Total Organics		10 ppm max	10 ppm max	13,400
(R)	Hydrochloric Acid (as HCl)				10,103
	20° Be		31.45-33.29	31.45-33.29	
	22°		35.21 min	35.21 min	
	23°		37.14 min	37.14 min	
(R)	Residue		Std. 3 max	--	10,079
(AI)	Iron*		1 ppm max	1 ppm max	10,077
(AI)	Sulfates		100 ppm max	100 ppm max	10,078
(AI)	Arsenic		0.2 ppm max	0.2 ppm max	10,074
(AI)	Heavy Metals		1 ppm max	1 ppm max	10,515
(AI)	Nonvolatile Residue		0.5% max	0.5% max	13,248
(AI)	Oxidizing [illegible]		30 ppm max	30 ppm max	13,294
(AI)	[illegible]		70 ppm max	70 ppm max	13,299

This material [illegible] requirements listed in the Food Chemicals Codes.

* Analyzed when Color is above 35 APHA.

Sales Codes
20° 6430-205-63-003
22° 6430-221-63-003
23° 6430-231-63-003

CER 089462

(R) Routine Analysis
(AI) Analyzed at intervals

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MONSANTO INDUSTRIAL CHEMICALS COMPANY

PRODUCT: Muriatic Acid - A Grade

SALES CODE: Refer to bottom of Page 1

PAGE 2 OF 2 ISSUE DATE OF PAGE: 11/1/82

CUSTOMER REQUIREMENTS

CUSTOMER NAME	E. Cooper Sauget, Il	A.E.Staley			
EFFECTIVE DATE	12/76	4/78			
CHARACTERISTICS	LIMITS/METHOD NUMBERS				
Color, APHA	250 max.				
Heavy Metals (as Lead), ppm	1 max.	5 max.			
Sulfates, ppm	50 max.				
Iron, ppm	10 max.				
Arsenic (as As_2O_3), ppm	0.2 max.	0.2 max.			
Organics	5 max.	5 max.			

CER 089463

PRODUCT QUALITY REPORT REMARKS

APPROVALS – DATE

CHIEF CHEMIST: H.J. Horner — H.J. Horner 10/1/82

J.H. Boehm — J.H. Boehm 10/13/82

R.W. Varnado — R.W. Varnado 10/19/82

RESEARCH: D.K. Lynch — D.K. Lynch 10/18/82

MARKETING OR PRODUCT MANAGER: R.G. Glover — R.G. Glover

MANAGER PRODUCT ACCEPTANCE: C.P. Farley

NOTE: These requirements are a part of the Finished Product Specification for the customer shown. Characteristics and Limits listed may be discussed only with that customer.

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CONFIDENTIAL 92-CV-204-WDS

EPA/CERRO COPPER/EIL/PCB ATTORNEY WORK PRODUCT / ATTORNEY CLIENT PRIVILEGE

MONSANTO INDUSTRIAL CHEMICALS CO.

RAW MATERIAL SPECIFICATION

MATERIAL NO. 14700	DEPT. OR JOB 233	PAGE 1 OF
FOR USE IN: Monochlorobenzene		APPROVALS – DATE
PLANT: W.G. Krummrich Plant	ISSUE NO./DATE: 3/8/83	SUPERSEDES SPEC. NO./DATE: 2/16/83
MATERIAL (TRADE NAME): Benzene	GRADE	CHIEF CHEMIST: H.J. Horner
MATERIAL (CHEMICAL NAME): Benzene		PLANT PURCHASING AGENT: J.H. Marshall
CHEMICAL FORMULA		GROUP LEADER, R & D: D.K. Lynch 3/1/83
		OTHER:
SAMPLE FOR ANALYSIS: 2 x 16 oz. bottles		MGR. PRODUCT ACCEPTABILITY: C.P. Farley
APPROVED SUPPLIERS: Shell, Sun, Exxon		

MGR., MANUFACTURING: R.A. Pohl 3/1/83

SUPT., MANUFACTURING: J.W. Boehm 2/24/83

CHARACTERISTICS		LIMITS	METHOD NO.
(R)	Appearance	Clear liquid with no free water or suspended matter	10,260
(R)	Color (APHA)	20 max.	10,260
(R)	Crystallizing Point (Wet)	5.35°C min.	10,263
(R)	Bromine Number	0.005 max.	12,969
	Distillation Range		10,262
	100%	1.0°C max.	
	Range to Include	80.1°C	
	Specific Gravity		
	25/25°C	0.874–0.878	
	12.2/15/5°C	0.882–0.886	
	Water	150 ppm max.	13,164
(R)	Composition by GC		13,226
	Aliphatics	600 ppm max.	
	Toluene	150 ppm max.	
	Thiophene	1 ppm max.	
	High Boilers	10 ppm max.	
	Acidity	None	10,265
	Copper Corrosion	Pass Test	ASTM D-849
	Sulfur Compounds	Free of H_2S or SO_2	ASTM D-853
	Acid Wash Color	Barrett Std. 2 max.	10,264

Certificate of analysis to be sent to Chief Chemist, Monsanto Company, Sauget, Il. 62201 on day of shipment.

(R) Routine analysis, all others on request only.

CER 089464

MONSANTO INDUSTRIAL CHEMICALS CO.

RAW MATERIAL SPECIFICATION

MATERIAL NO. 57080	DEPT. OR JOB 233	PAGE ___ OF ___
FOR USE IN: Monochlorobenzene		APPROVALS – DATE
PLANT: W.G. KRUMMRICH PLANT	ISSUE NO./DATE: 2/24/82	SUPERSEDES SPEC. NO./DATE: 3/7/79
MATERIAL (TRADE NAME): Sulfur	GRADE: Flour Ground	MGR. MANUFACTURING: K.F. Thompson 2/18/82
MATERIAL (CHEMICAL NAME): Sulfur		SUPT., MANUFACTURING: J.W. Boehm
CHEMICAL FORMULA: S		CHIEF CHEMIST: H.J. Horner
SAMPLE FOR ANALYSIS: 1 x 16 oz. WM Jar		PLANT PURCHASING AGENT: A.R. Nagel
APPROVED SUPPLIERS: G.S. Robins		GROUP LEADER, R & D: D.K. Lynch
		OTHER:
		MGR. PRODUCT ACCEPTABILITY: C.P. Farley 2/19/82

CHARACTERISTICS	LIMITS	METHOD NO.
• Purity	99.5% min.	--
Acidity (as H_2SO_4)	0.05% max.	12,170
Ash	0.10% max.	12,058
Moisture	0.15% max.	11,759
Fineness	90% thru USS 80 Screen	

Supplier's certificate of analysis to be sent to Chief Chemist, Monsanto Company, Sauget, Illinois 62201 on day of shipment.

CER 089465

MONSANTO INDUSTRIAL CHEMICALS CO.

RAW MATERIAL SPECIFICATION

MATERIAL NO: 51970	DEPT. OR JOB: 209, 221, 218, 750	PAGE ____ OF ____
FOR USE IN:		APPROVALS - DATE
PLANT: W.G. KRUMMRICH PLANT	ISSUE NO./DATE: 4/15/82	SUPERSEDES SPEC. NO./DATE: 3/16/79
MATERIAL (TRADE NAME): Soda Ash	GRADE: Dense	CHIEF CHEMIST: H.J. Horne
MATERIAL (CHEMICAL NAME): Soda Ash		PLANT PURCHASING AGENT: A.R. Nagel
CHEMICAL FORMULA: Na_2CO_3		GROUP LEADER, R&D: D.K. Lynch 5/24/82
SAMPLE FOR ANALYSIS: 1 x 16 oz. WM Jar		OTHER:
APPROVED SUPPLIERS: Chemtech Industries, G.S. Robins		MGR. PRODUCT ACCEPTABILITY: C.P. Farley / R.B. Hudson

CHARACTERISTICS	LIMITS	METHOD NO.
Sodium Carbonate	99.8% min.	10,249
Sulfates	0.05% max.	10,247
Chlorides	0.05% max.	10,246
Iron	5 ppm max.	--
Water Insolubles	25 ppm max.	10,248
Bulk Density	60 lb/cu. ft.	--

Supplier's certificate of analysis to be sent on day of shipment to Chief Chemist, Monsanto Company, Sauget, Illinois 62201.

CER 089466

MONSANTO INDUSTRIAL CHEMICALS CO.

RAW MATERIAL SPECIFICATION

MATERIAL NO. 17835	DEPT. OR JOB 218	PAGE 1 OF 1
FOR USE IN: Remove organics, Carbon Tower		APPROVALS – DATE
PLANT: W.G. Krummrich Plant	ISSUE NO./DATE: 3/10/83	SUPERSEDES SPEC. NO./DATE: 1/15/80
MATERIAL (TRADE NAME): Acrivated Carbon	GRADE: WITCARB 940-8 x 30 mesh	
MATERIAL (CHEMICAL NAME): Carbon		
CHEMICAL FORMULA: C		
SAMPLE FOR ANALYSIS: Not routinely analyzed		
APPROVED SUPPLIERS: WITCO Chemical		

MGR., MANUFACTURING: R.A. Pohl 3/1/83

SUPT., MANUFACTURING: J.W. Boehm J.W. Boehm 3/2/83

CHIEF CHEMIST: H.J. Horner H.J. Horner 3/1/83

PLANT PURCHASING AGENT: J.H. Marshall J.H. Marshall 3/2/83

GROUP LEADER, R & D: G.J. Lynch G.J. Lynch 3/1/83

OTHER:

MGR. PRODUCT ACCEPTABILITY: C.P. Farley C.P. Farley 3/9/83

CHARACTERISTICS	LIMITS	METHOD NO.
Mesh Size		
On USS #8	5% max.	
Thru USS #30	5% max.	
CCl_4 Activity	40-50%	
Moisture	1% max.	
Ash	1% max.	

Supplier's certificate of analysis to be sent on day of shipment to Chief Chemist, Monsanto Co., Sauget, IL 62201.

CER 089467

NOTE: THIS SPECIFICATION IS THE PROPERTY OF MONSANTO COMPANY AND IS FOR INTERNAL USE ONLY. IT MAY NOT BE RELEASED WITHOUT WRITTEN APPROVAL BY DIVISION PRODUCT ACCEPTABILITY.

(REV. 8/74)

MONSANTO INDUSTRIAL CHEMICALS CO.

RAW MATERIAL SPECIFICATION

MATERIAL NO.: 17830	DEPT. OR JOB: 218	PAGE ____ OF ____
FOR USE IN: Remove Organics, Carbon Tower		APPROVALS – DATE MGR., MANUFACTURING: R.A. Pohl 3/15/83
PLANT: W.G. Krummrich Plant	ISSUE NO./DATE: 3/21/83 / SUPERSEDES SPEC. NO./DATE: 1/15/80	SUPT., MANUFACTURING: J.W. Boehm 3/2/83
MATERIAL (TRADE NAME): Activated Carbon	GRADE: CAL 12 x 40 mesh	CHIEF CHEMIST: H.J. Horner 2/28/83
MATERIAL (CHEMICAL NAME): Carbon		PLANT PURCHASING AGENT: J.H. Marshall 3/2/83
CHEMICAL FORMULA: C		GROUP LEADER, R & D: G.S. Lynch / M.K. Lynch 2/28/83 OTHER:
SAMPLE FOR ANALYSIS: Not Routinely Analyzed		MGR. PRODUCT ACCEPTABILITY: C.P. Farley 3/16/83
APPROVED SUPPLIERS: Calgon Corp.		

CHARACTERISTICS	LIMITS	METHOD NO.
Mesh Size		
On USS #12	5% max.	
Thru USS #40	4% max.	
Iodine Number	1000 min.	
Ash	10% max.	
Moisture (as packed)	2% max.	
Abrasion Number	75 min.	

Supplier's certificate of analysis to be sent on day of shipment to Chief Chemist, Monsanto Co., Sauget, IL. 62201.

CER 089468

MONSANTO INDUSTRIAL CHEMICALS CO.	MATERIAL NO. 17600	DEPT. OR JOB 218	PAGE 1 OF 1
RAW MATERIAL SPECIFICATION	FOR USE IN: Remove Organics, HCL Skid		APPROVALS – DATE MGR., MANUFACTURING: R.A. Pohl 3/4/83
PLANT: W.G. Krummrich Plant	ISSUE NO./DATE: 3/10/83	SUPERSEDES SPEC. NO./DATE: 1/21/80	SUPT., MANUFACTURING: J.W. Boehm 3/2/83
MATERIAL (TRADE NAME): Activated Carbon	GRADE		CHIEF CHEMIST: H.J. Horner 3/2/83
MATERIAL (CHEMICAL NAME): Carbon			PLANT PURCHASING AGENT: J.H. Marshall 3/2/83
CHEMICAL FORMULA: C			GROUP LEADER: G.J. Lynch/D.K. Lynch 3/3/83 OTHER:
SAMPLE FOR ANALYSIS: Not Routinely Analyzed			MGR. PRODUCT ACCEPTABILITY: C.P. Farley 3/9/83
APPROVED SUPPLIERS: Calgon Corp.			

CHARACTERISTICS	LIMITS	METHOD NO.
Mesh Size		
On USS #4	5% max.	
Thru USS #10	3% max.	
Iodine Number	1050 min.	
CCl_4 Adsorption	60% min.	
Ash	8% max.	
Moisture (as packed)	2% max.	
Hardness Number	90-93 min.	
Apparent Density	0.47 g/cc min.	

Supplier's certificate of analysis to be forwarded on day of shipment to Chief Chemist, Monsanto Company, Sauget, Il. 62201.

CER 089469